

Proof of Concept of an Iron-Iron(III)oxide hydroxide Battery Working at Neutral pH

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An iron-iron(III)oxide hydroxide battery working in a neutral pH range is introduced. It employs electrochemical deposition of metallic Fe at the negative electrode and Fe^{III}OOH at the positive electrode during charge and dissolution of both during discharge in an aqueous Fe^{II} electrolyte. The working principle was validated with cyclic voltammetry, charge-discharge cycles, weighing, profilometry, X-ray diffraction, scanning electron microscopy, and energy dispersive X-ray analysis. The coulombic efficiency over seven cycles is (49 ± 5) %, while it is (40 ± 2) % for the voltaic efficiency and (20 ± 1) % for the overall efficiency using current densities for charging and discharging of 1.2 mA cm⁻² and 0.4 mA cm⁻² at the negative electrode and 24 μA cm⁻² and 8 μA cm⁻² at the positive electrode. .

Keywords: Lepidocrocite; Low-cost battery; Neutral electrolyte; Fe^{II}; FeOOH

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